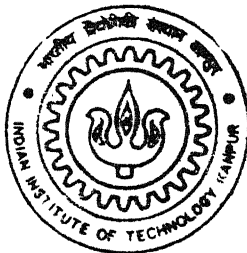


# AN EXPLORATORY STUDY ON MANAGEMENT OF ERP IMPLEMENTATION

by  
ASHISH SINGHAL

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DEPARTMENT OF INDUSTRIAL & MANAGEMENT ENGINEERING  
INDIAN INSTITUTE OF TECHNOLOGY KANPUR

February, 2000

**AN EXPLORATORY STUDY ON  
MANAGEMENT OF ERP IMPLEMENTATION**

A thesis Submitted  
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**Master of Technology**

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**ASHISH SINGHAL**

to the  
**DEPARTMENT OF INDUSTRIAL & MANAGEMENT ENGINEERING  
INDIAN INSTITUTE OF TECHNOLOGY**

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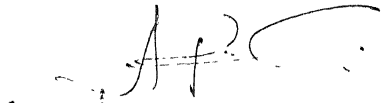


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## CERTIFICATE

This is to certify that the work contained in the thesis entitled “AN  
**EXPLORATORY STUDY ON MANAGEMENT OF ERP  
IMPLEMENTATION**” has been carried out under my supervision and has not  
been submitted elsewhere for a degree.



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February, 2000

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## **ABSTRACT**

The thesis explores the process of implementation of Enterprise Systems in two manufacturing companies in the Indian industry. Enterprise Systems integrate the various information flowing through an organization and help it in competitive advantage & cost reduction. The successful implementation of Enterprise Systems is affected by several factors. Studies concerning these types of implementation projects should aid the top management who is in midst of implementation project or plans to implement it in the near future, by providing them with the relevant information on the implementation, since these projects involve a lot of cost and management attention to deliver the benefits.

The study has been carried out using two case studies. Based upon the analysis of the case-studies, some major attributes of a successful implementation process in companies have been extracted. Finally a model is proposed relating the factors affecting the Enterprise System implementation and these attributes.

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**Ashish Singhal**

# **Chapter 1**

## **INTRODUCTION**

### **1.1 INFORMATION TECHNOLOGY AND BUSINESS**

Information revolution is sweeping businesses and there is no way to escape its effects. In this day and age of high competition, the rules of doing business are changing fast because of dramatic reductions in the cost of obtaining, processing and transmitting information. The emergent manufacturing business, in its structure and in its management problems and concerns, will bear little resemblance to the typical manufacturing company of the 1950s. Instead it is far more likely to resemble organizations like, the hospital, the university, the symphony orchestra. The business will be knowledge based, an organization will be composed of specialists who will monitor their performance through organized feedback from colleagues, customers and headquarters. This will be an information-based organization (Drucker, 1988).

In many industries not widely considered information business, information actually represents a large percentage of the cost of the cost structure (Evans et al, 1997). Information is the glue that holds together the structure of all business. For instance information defines supplier relationships, it determines the

relative bargaining power of players and in many businesses it forms the basis for competitive advantage.

Over the decades, companies have used Information Technology (IT) in increasingly sophisticated ways to run parts of a business. From the mainframe complexes of the 1960s to the client– server platforms and distributed computing of the 1990s, computers help executives manage by automating business processes from payroll to cash dispensing.

Information technology has brought about the flexibility and responsiveness in the organization by vastly reducing the constraints imposed by time and space in acquiring, integrating and acting on information. Top management in all companies is being forced to rethink the strategic fundamentals of their business. This new technology can release information simultaneously throughout an organization as events are taking place thereby extending top management's control. It can monitor processes and people and integrate their actions to a greater extent than ever before.

## **1.2 STRATEGIC SIGNIFICANCE OF "IT"**

The role of information technology has always been to help organizations solve critical business problems or deliver new services by collecting data, turning data into information, and turning information into knowledge quickly enough to reflect the time value of knowledge. However from

the last few years IT is changing the way companies compete by effecting the entire process by which companies create their products. An important concept, which highlights the role of IT in competition, is the value chain. Typically the company's activities are divided into the technologically and economically distant activities it performs to do business, which are called value activities. IT is permeating the value chain at every point, transforming the way value activities are performed. This basic effect explains why IT has acquired strategic significance and is different from the many other technologies businesses use.

Each value activity has a physical and an information processing component and different activities require a different mix of the two components. The physical component encompasses all the physical tasks required to perform the activity, the information-processing component includes the steps required to capture, manipulate and channel the data necessary to perform the activity. Each value activity creates and uses information of some kind. A logistic activity, for example, uses information like scheduling, transformation and production plans to ensure timely and cost effective delivery. A service activity uses information about service requests to schedule calls and order parts, and generates information on product failures that a company can use to revise product designs and manufacturing methods. IT is spreading through the value chain and is performing optimization and control functions as well as more judgmental executive functions. IT is generating more data as a company performs its activities and is permitting it to collect or capture information that was not available before; it also

helps in a more comprehensive analysis and use of the expanded data. The number of variables that a company can analyze or control has grown dramatically. IT can not only affect how individual activities are performed but also how companies can coordinate their actions more closely with those of their buyers and suppliers. One of the ill effects of IT is too much information. This problem creates new use of IT to store and integrate properly the flood of information available to executives.

### **1.3 CONTEXT OF THE STUDY**

Enterprise Resource Planning (ERP) is one such enterprise wide management system, made possible by information technology. Referred variously as Enterprise Systems (ES) or Enterprise- Wide Information Integration Systems (EWIS), these commercial software packages promise the seamless integration of all the information flowing through a company- financial and accounting information, human resource information, supply chain information etcetera.

ERP can help organizations in addressing needs like optimum use of the resources, minimize the cost of production, reduce cycle time, reduce inventories and share information seamlessly across the organization. These systems promise an off- the –shelf solution to the problems of business integration

to management who has struggled at great expense and with great frustration, with its incompatible information systems and inconsistent operating practices.

It is estimated that companies around the world paid \$ 10 to 20 billion in the year 1997 alone on enterprise systems implementation. While the rise of the Internet has received most of the media attention in recent years, the business world's implementation of enterprise systems may in fact be the most important development in the corporate use of information technology in the 1990s (Davenport, 1998). Studies show that, by 2001 most Indian companies will not have the option of being indecisive about ERP, especially if they want to compete with their competitors (Business Today, May1999).

#### **1.4 THE PRESENT STUDY**

It is such a context that a study on ERP implementation becomes useful. Any such study, concerning the implementation of ERP, should aid the policy makers as well as the top management of organizations, by providing them with relevant information on how the process of ERP implementation works.

The objective of the present work is to study the ERP implementation process in the Indian companies and to determine & assess the influence of factors from the context of the process of implementation for Indian companies.

## **Chapter 2**

### **ENTERPRISE RESOURCE PLANNING – AN OVERVIEW**

Enterprise Resource Planning (ERP) means planning the resource on an entire enterprise for all its offices, factories, depots etc. ERP software is the integrated backbone that controls the entire information system of an organization. It provides the crucial information links between the various departments in the organization- sales, service distribution, marketing, manufacturing, purchase, inventory, finance and accounts and so on. All these departments are integrated on one software backbone. Thus ERP systems integrate key data and communications on planning, scheduling, forecasting and finance for companies across regions, products, divisions, and functions.

#### **2.1 ERP EVOLUTION**

ERP software has evolved originally from inventory planning software. In the 1960's, the era of inventory control, software packages usually customized were designed to handle inventory based on traditional inventory concepts. 1970's saw a shift in focus to Materials Requirement Planning (MRP) system. MRP is a sequential software technique, which is used for converting the MPS (Master Production Schedule for the end items or options offered to the customers) into detailed schedule for raw material and components. This was a major breakthrough in manufacturing planning & control made feasible by random access computers. MRP starts with master production schedule as inputs, (MRP has two other basic inputs- a bill of material and inventory status) and ends with detailed schedules for components made in-house as well as purchased from vendors. Thus MRP is a detailed planning process for components to support the MPS.

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In the 1980s MRP evolved into Manufacturing Resource Planning (MRP II), a term coined by Oliver Wight, which was an extension of MRP to shop floor and few other important aspects of business. MRP II is a tool for planning engineering, operational and financial resources of an organization. In the early 90s, MRP II was further extended to cover areas like Engineering, Finance, Human Resources, Project Management etc, i.e the complete gamut of activities within any business organization. Hence the term Enterprise Resource Planning (ERP) was coined. The hearth of ERP is the MRP system and around this other resources are planned and controlled.

## **2.2 WORKING OF ERP SYSTEMS**

In order to understand the working of ERP systems, as well as their potential implications, we first need to understand the problems they are designed to solve: the fragmentation of information in business organizations

Every company collects, generates, and stores some quantities of data. In most companies, though, the data are not kept in a single repository. Rather, the information is spread over many separate computer systems, each housed in an individual function, factory, or office. Each of these systems may provide invaluable support for a particular business activity. But, in combination, they represent one of the heaviest drags on business productivity and performance.

Maintaining many different computer systems leads to enormous costs for storing and rationalizing redundant data, for rekeying and reformatting data from one system for use in another, for updating and debugging obsolete software code, for programming communication links between systems to automate the transfer of data. But even more important than the direct costs are the indirect ones. For example, if a company's sales and ordering systems can not talk with its production scheduling systems, then its manufacturing productivity and customer responsiveness suffer. If its sales and marketing systems are incompatible with its financial reporting systems, then management is left to make important decisions by instinct rather than according to a detailed understanding of product and customer profitability. In short, if a company's systems are fragmented, its business is fragmented.

In a good enterprise system, a single comprehensive database forms its core. The database collects data from and feeds data into modular applications supporting almost all of a company's business activities- across functions, across business units. When new information is entered in one place, related information is automatically updated. Thus an ES streamlines a company's data flows and provides management with direct access to a wealth of real-time operating information.

Typical ERP software works in this way. Suppose a sales executive of a company gets an order from a customer for a product of particular

specifications. He would input the some basic information about the customer's requirements into his computer terminal. The information would immediately be communicated to all the concerned departments by the ERP backbone. Finance would be informed so that it can raise the estimate and the advance bill and also take the order into account in their projections. Manufacturing would be informed so that they can schedule the production and meet the deadline. Inventory would be checked to see if the required components are in stock. Purchase would place the order for those components that are not in stock to appropriate suppliers and so on. Finally the sales staff can tell the customer the exact date when he can collect the product. Thus ERP can help companies to automate their processes and to use Materials Requirement Planning (MRP) mechanism for planning & control of materials and other resources.

Single ERP systems can replace then legacy (current) financial, manufacturing, distribution and human resources systems

## **2.3 THE TECHNOLOGY OF ERP**

ERP support system consists of the system architecture for ERP, the operating systems (OS) on which the application server, transaction server & database server operates and the database software to support the ERP solution

Most companies preferred a two- tiered architecture for support system. Tiering enables a company to ensure that while ERP links all managers

who need to be linked, only who need to use a certain piece of information to take decisions have access to it. Thus this type of system architecture classifies information as being either operational - which can be shared across the organization- or strategic- which needs to be known only to top management making strategic decisions.

The 3 kinds of servers- application, transaction, and database- essentially serve 3 different purposes. The application server takes care of front-end applications, the transaction server is responsible for On- Line Transaction Processing (OLTP) or real- timework, and the database server is the repository of data. In effect, the transaction server accomplishes specific tasks by using data from the database server and applications from the applications server.

ERP applications are now extending beyond their initial mandate, and latest ERP applications now integrate not only business process within an organization, but also supply chain management and customer chain management functions outside the enterprise.

## **2.4 ERP IN INDIA**

The \$17.9 million Indian ERP market (1997-98) owed its revenues to both large and medium scale companies that opted to install an ERP solution.

(Computers Today, August 1998) International Data Corporation estimates that the ERP applications market in India will grow by 50-60 % in the next few years

Accounting functions make up the greatest end use of ERP applications, followed by manufacturing. This bias can be explained by the fact that ERP applications evolved from manufacturing resource-planning solutions. This focus on manufacturing and other discrete, process industries expanded after 1996, as ERP applications began integrating functionality specific to vertical segments. These segments include government & education, utilities, telecom, banking & finance, and retail & transportation.

An ERP market survey<sup>1</sup> conducted in India by Dataquest in 1999 indicates a fragmented market of ERP applications. According to survey, SAP, JD Edwards, Mfg/ Pro, Marshal, Oracle Financials, Baan, MAMIS are the main players with SAP being the market leader. The survey also indicates that IBM, HP and IBM are respectively the preferred application server vendor, transaction server vendor and database server vendor in India. Similarly Unix is the preferred OS for all 3 servers and Oracle was the preferred RDBMS as database software in India.

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<sup>1</sup>The survey covered 100 companies which had either implemented ERP, were in the process of doing so, or planned to do so. The research covered companies with a turnover of over Rs 100 crore, spanning 3 centres, Bangalore, Delhi, and Mumbai.

A further trend will see the integration of other functions like data warehousing, data mining, electronic commerce, internet/ intranet, product data management and CAD/CAM applications

## Chapter 3

### LITERATURE SURVEY

The earlier literature (HBR Case Study, May-June 1997, Vollman, Berry, and Whybark, 1989, Robbins, 1990) available on implementation of information processing systems, new technology projects and change management give an insight into the several critical aspects of the successful implementation of such projects. For most companies new systems bring profound changes. People do their jobs differently and have new ways of thinking about their jobs and how these relate to other jobs.

Vollman, Berry and Whybark (1989) tell about goal settings, organization change, and education about projects and finally monitoring of the implementation process as key attributes for successful implementation.

Sundar (1999) cites psychological factors as resistance to uncertainty inherent in change process. Workers may have uncertainty as to

- How difficult the new work method would be?
- Whether it could be easily learned?
- How long it would take to become familiar with it?

- Whether the proposed change warrants trimming of work force size?

- Whether it would necessitate their being transferred to other departments or to new stations?

We have come across two major studies specific to ERP projects implementation (Davenport,1999, Buckhout, Frey and Joseph,1999)

According to Davenport for a large manufacturer, these systems can become the basis for introducing a global lean- production model By imposing, common operating processes on all units, companies can able to achieve tight coordination throughout their businesses They can rapidly shift sourcing, manufacturing, and distribution functions worldwide in response to changing patterns of supply and demand

The implementation of ERP systems associates a lot of technical challenges for the management These systems are profoundly complex piece of software, and installing them requires large investment of money, time and expertise. But the technical challenges, however big, are not the main factors for a successful implementation The biggest challenges are business problems

In his study of more than 50 businesses with enterprisc systems, Davenport identifies company's strategy, organization, and culture as the main



scope of an enterprise system. For example, it pushes a company towards full integration even when a certain degree of business unit segregation may be in its best interest. And it pushes a company towards generic process even when customized processes may be a source of competitive advantage.

He makes it clear by pointing the universal applicability of these systems as major characteristics. When developing information systems in the past, companies would first decide how they wanted to do business and then choose a software package that would support their proprietary processes. They often rewrote large portions of the software code to ensure a tight fit. With enterprise systems, however the sequence is reversed. The business often must be modified to fit the system. In many cases, the system will enable a company to operate more efficiently than it did before. In some cases, though, the system's assumptions will run counter to a company's best interests.

Davenport questions the vendor's definition of best practices in these systems and says that system's technical imperative can coincide or conflict with the company's business imperatives. He gives examples of Autodesk Computers, Air products & Chemicals, Hewlett- Packard and others, where installations of enterprise systems raised different strategic issues to the management. In some organizations, by providing universal, real- time access to operating and financial data, the system allowed companies to stream- line their management structures, creating flatter, more flexible, and more democratic

organizations. In others, centralization of control over information and the standardization of processes resulted in hierarchical, command- and control structure with uniform culture

According to Davenport, the companies deriving the greatest benefits from their systems are which, from the start, viewed them primarily in strategic and organizational terms. They stressed the enterprise, not the system.

Davenport cautions the companies going to install an enterprise system without first having a clear understanding of the business implications. Even then top management continues to view the installation of an ES as primarily a technological challenge and push responsibility for it down to their information technology departments. According to Davenport, the logic of the system may conflict with the logic of the business, and either the implementation will fail, wasting vast sums of money and causing a great deal of disruption, or the system will weaken important sources of competitive advantages of the company.

Finally he concludes that, considering an ES's far reaching strategic and organizational implications, the worst thing a company can do is to make decisions about a system based on technical criteria alone.

Buckhout, Frey and Joseph (1999), after more than five years of helping top management implement ERP systems believe that there are two major issues in the ERP implementation. The first is the strategic choice needed to

configure the systems & processes and the other is business control over implementation process

ERP systems integrate key data and communications on planning, scheduling, purchasing, forecasting, and finance for companies across regions, divisions and functions. The system can provide management detailed insight into the operations of the business. The authors argue that while an ERP system can provide this information, the key question is should it provide this? Because the amount of control over a company's operations that needs to be provided by the ERP system depends on the design of the flow of products and services in the company. Sometimes a well designed value chain (e.g., "Product- Aligned Flow," in which the product flows using visual signals and well defined routes) can embed many of the controls and other functions in the business process simply and far less expensively than the ERP system possibly could.

According to authors for getting the strategic choice-made, it is important that ERP systems be implemented in a business driven cost- effective fashion from the start. Management needs to translate the business strategy/ key future competitive advantages into factors for the implementation. Management should ask about the type of information, nature of communication and place of control before implementing ERP. This strategy should be translated in to concrete priorities and then it should be decided how the ERP implementation would help the company deliver some, but not all of these priorities.

The authors after their interactions with many top executives say that generally the business case for implementing an ERP system is invariably built around significant cost reductions and improved capabilities. The cost savings are based on reduced legacy information technology costs as well as decreased indirect labor, direct labor and inventory costs. Improved capabilities often include world class processes, tighter control and reduced cycle time. But once the business case is closed, companies often focus on software and not business objectives- with an implicit assumption that the benefits will follow. They mistakenly view the endeavor as an information technology project, not a business project and thus typically relegate too much responsibility to technical experts. Under this scenario, it is not long before the implementation begins to go off track. As a result, the organization, having lost sight of any business objective, implements a crippled system, or one that is overloaded with unnecessary functionality.

The authors suggest that to keep the implementation process from spinning out of control, chief executive officer should lead the project, because having chief executive officer as in-charge defines a different level of involvement in the implementation process. The authors from their experience suggest that generally top management is not sure of the role they should play, hence they do not actively participate in such projects. According to authors when the technologists make the technological decisions and senior management makes

the strategic and business ones, the implementation meets its objectives, budgets and schedules

The top management can get involved in three ways: by clearly outlining the organization's strategic priorities, by involving the organization at the appropriate levels, and by linking management controls and incentives to project success. Companies need to establish guidelines for involvement – or “rule of engagement” for different levels in the organization- so team members understand how and where their skills will be utilized and, more importantly, what issues they should resolve and what issues they need to raise to next level of management. A well-constructed implementation allows the people who best understand the issue to make the decisions.

The authors cite the examples from some successful implementations like Bay Networks, Owens Corning, where companies developed strategic objectives to communicate it to their organization & implementation team and made the decisions to modify the basic ERP software to match strategic goals.

In the authors' approach, various levels of the organization engage in a series of dialogues, which help move the process along while aligning it with key strategic and operating priorities. The company translates the various choices

that must be made during the implementation into the right language so dialogue can occur through the organization

## **Chapter 4**

### **RESEARCH DESIGN**

With the paucity of Literature, and with simultaneous evolution in the field, we found it necessary to view our study as an “exploratory” one. It would give us a tentative description of the field in India.

#### **4.1 RESEARCH DIRECTION**

As pointed out by Davenport, an enterprise resource planning system imposes its own logic on a company's strategy, organization and culture. The system implications may not fit into each and every organization's management model. There are a host of issues involved in the selection & implementation of a particular software package, which needs careful attention from the top management of an organization. Based on the literature we prepared a broad framework and the following factors, which may affect the implementation process.

- Current business strategy of the organization
- Why it went for ERP and where does ERP fit into the organization's management model

- What were the expectations of the top management from the ERP
- How did it go about the whole implementation exercise
- After implementation what is the thinking & experience of the top management Are they moving along the expected lines or in a different direction

Further based upon literature, we identified other relevant aspects around which the research was to be conducted in order to capture the effects that these factors would have on the process of ERP implementation These aspects are:

- Business goals associated with the ERP
- Project scope and experience
- Selection of software package & implementation partner
- Selection & design of the project team
- Top management involvement & commitment
- Implementation technique employed by the top management
- Time frame & cost associated with the project



- Effect of the business environment on the whole exercise
- Parameters on which the success of the exercise is measured

## 4.2 CHOICE OF METHOD

To focus attention on the above aspects and to generate a meaningful description of ERP implementation requires appropriate methodology. Literature indicates that studies in social sciences typically have the following characteristics:

- Events take place over a long period of time
- It is difficult to isolate, identify and characterize the causal events or situations as these may be inter-related driving one and other, or facts may be embedded in their historical perspective, or are stated in terms of subjective experience
- Explanations are probabilistic in nature

Therefore a wider range of research strategies are used in social sciences. These include (Yin, 1984)

- Experimental investigations
- Survey research

- Case studies
- And others

The present study covers the various issues of enterprise resource planning systems in the Indian companies. ERP projects are stretched over a long period of time and consist of a complex interaction between phenomena (project) & its context (environment). Thus, the phenomenon under study is not easily distinguishable from its context and dictates inclusion of the context as a major part of the study. Thus the situation typically warrants the use of case study and hence the same has been adopted for the research work.

Yin (1984) defines a case study as an empirical study that investigates a contemporary phenomenon within its real-life context, when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidences are used.

Also the case study is the most widely used method in research on management information systems. It is noted that, whereas traditional MIS systems were simply a sub function of an organization, the newer MIS could potentially lead to the restructuring of the entire organization, with the firm in its entirety becoming an MIS and hence only the case study could capture such dynamic, changing conditions (Yin, 1984).

Though qualitative methods like case studies are not very strong with respect to verification using statistical criteria. However, they lead to more complete description and analysis of process dynamics. Further it is easier to trace the history of change in a descriptive format that a case study provides (Rajagopalan, 1995)

## **4.3 DATA COLLECTION**

### **4.3.1 DESIGN OF SEMI- STRUCTURED INTERVIEW**

From the earlier literature available on ERP implementation, IT projects and change management, we prepared a semi- structured interview. This interview, essentially for top management, consisted of various strategic issues ranging from company's strength, weaknesses, future plans, to reasons for going ERP, expectations from ERP, vendor & software selection, training to employees, project scope & progress of project and experience with ERP. We also prepared two other semi-structured interviews for IT personnel and end users. The interview of IT personnel was designed to know about the role of IT in the organization, software & hardware selection and their views about new system. End user's interview was used to cover their opinion about new system, and the training they received during the project.

#### 4.3.2 METHOD OF PRIMARY DATA COLLECTION

After preparing semi-structured interview, we carried out pilot study in two local companies, which were using IT in their day- to -day activities. From their responses, we made some modifications in our questions to elicit more response from interviewing people. Meanwhile we compiled a list of companies from various sources, which had recently undertaken or implement ERP in their organizations and sent them request letter for getting permission to do study there.

Criteria for choosing the number of case studies to carry out were:

- To do as much as we could afford in terms of time and material resources available to us
- To have as much that should result in a rich analysis

Thus we carried out two case studies. The companies we chose are from auto components and pharmaceutical industries. Both have recently implemented an ERP system in their organizations. Apart from that there were no other criteria to choose, and the companies that we studied were due to their response to our request to study them. In the process of the study the key executives namely chief executive officer & managing director, chief information officer (EDP manager), chief financial officer, and heads of other functional group of the organizations were interviewed. Also some of the users of the system and other key functionaries in the EDP department were interviewed.

Both the case studies were conducted over a period of 15 working days. The data was collected in the following manner:

Step 1: Information was obtained so as to know all the personnel relevant to the implementation process. Each of them was interviewed for one hour to two hours, with a set of questions for an unstructured interview.

Step 2: Some of the personnel interviewed in the above step were again interviewed to clarify certain inconsistencies that we noticed in their responses.

We took note of the conversation during the interviews, and almost always made a fair copy of these in order to avoid any loss of data on our part.

Apart from this, data was also collected through other sources of evidence like organization charts, company's brochure & annual reports and secondary sources of data like news reports, trade magazines.

## Chapter 5

### CASE: - SHRI RAJ HIDEO LIMITED

#### 5.1 HISTORY OF THE ORGANIZATION

Shri Raj Hideo (SRH<sup>1</sup>) is a multi unit, multi product group with interests in engineering & precision toolings, dyes and chemicals and textiles, and facilities spread over different parts of the India SRH group began its engineering activities in 1983 with the establishment of a Gas Cylinders company in Faridabad and entered the auto components industry in 1985 with the inception of Pseki Auto India<sup>1</sup> SRH has entered in joint venture with major auto manufactures to manufacture a range of products such as sheet metal stampings, press tooling, jigs & fixtures, and safety restraint systems. The client list of the SRH group includes Hideo, Hideo, Escorts, Ford, Telco and Iveco. The group has seven companies and eleven plants countrywide and is an established source for the components sector, white goods industry, and defense.

Shri Raj Hideo Limited (SRHL), is a joint venture between SRH group and Hideo Auto Limited (HAL). HAL is a leading auto manufacture in India in collaboration with a Japanese auto producer SRHL was set up in 1987

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<sup>1</sup> The name of the companies, ERP vendors, and the persons described in this case study have been changed to in order to protect their identity



to manufacture sheet metal components and welded subassemblies for various Hideo Kisuki models. The owners of the company are HAL (29.28%), two Indian promoters who are managing director & chairman of SRHL, & their Associates (29.28%) and the Public (41.44%). The company has its corporate office at New Delhi and two plants close to Delhi. One plant is located in the Hideo Joint Venture Complex. Other plant is situated around ten kilometers away. The gross turnover of the company for the financial year 1998-99 was around Rs 140 crores. With a profit after tax of Rs 3 crore. Demographically, the SRHL is a young organization as out of around 420 total permanent employees, 50% are in the age group of 30-40 years while 45% are in the age group of 20-30 years.

## **5.2 MANUFACTURING**

The commercial production in SRHL began in March 1989 and till April 1999 company has manufactured 207 different types of sheet-metal components, welded assemblies and exhaust systems, with 33,000 unit items supplied each day on a Just-in-Time (JIT) basis. The components and assemblies manufactured at SRHL are supplied mainly for its JV partner, Hideo Auto Limited (HAL) for its entire product range (models). The company has license to export its products but at present it does not directly export them, although it supply its components & assemblies for Hideo export vehicles. The company



also supplies its assemblies to other group companies like SRH Tools Ltd , which after value addition supply to major auto manufactures

The manufacturing facilities at SRHL include Press Shop, Weld Shop, Die Maintenance, 5 Axis CNC Laser cutting machine, dedicated facilities for manufacturing Exhaust Systems and in house Tool room Press shop has Press line with heavy and light mechanical and hydraulic Presses including automatic tandem line ranging from 120 Tons to 1000 Tons capacity Weld shops utilize an array of welding gadgets like stationary spot welding, MIG/ TIG welding, submerged arc welding and SPMs Exhaust system facilities include CNC pipe bending machines, pipe welding on SPMs, and baffle assembly stations. To keep the facilities running smoothly, a comprehensive tool room with a capability of designing, manufacturing, finishing and assembly of press tools, die casting dies, moulds, welding jigs and fixtures is integrated into the manufacturing facility.

### **5.3 COMPETITIVE ADVANTAGES**

The company competes both on quantity as well as on quality in its industry. SRH is the largest joint venture of Hideo Auto Limited, in collaboration with Kisuki Motor Corporation of Japan. It is one of the largest producers of automobile exhaust system in the country and a major original equipment manufacturer (OEM)



### **5.3.1 DELIVERY SYSTEM**

Components & assemblies produced in the company's plants are supplied directly to the assembly lines at customer locations. SRHL is one of the few suppliers that supply their products on JIT basis. At present, the company is a single source supplier to Hideo. The company supplies its components in just-in-time (JIT) as per its principal customer's (Hideo) requirements and Hideo does not keep the inventory of more than 4 hours. However, most of the company's vendors do not supply raw material in JIT to the company.

### **5.3.2 QUALITY**

Quality control is strictly maintained and process parameters are checked at every stage of the manufacturing process, in the company. Its in-house rejection rate is very low. The company's main customer, Hideo, prefers quality over quantity and does not accept the product until & unless it is satisfied with the quality of the product received. The company has been taking major programmes to improve the production process, by implementing Kaizen, 5 'S' and Value Analysis/ Value engineering in the various areas of the operations from time to time. The company has received many awards for its quality drive. Prominent among them are "Best Performing Vendor Award" in the Technology group from HAL for the four consecutive years-1993-97 and QS-9000 certificate by KPMG Peat Marvic. The company's mission is to achieve zero defect products.

and reduced, process variation & cost of quality To this end, the company under the guidance of a Japanese expert advisor on quality management advisor and with the support of the TQM division of CII and Engineering & QA Departments of HAL is implementing several world class practices to enable the company to achieve TQM improvements

#### **5.4 THE CAUSE FOR INFORMATION INTEGRATION SYSTEM**

Around late 90's, when the company grew in size, as one more plant was opened near Delhi, its top management felt the need of more and more integration between its various departments. Because management wanted a smoother information flow and have information about any particular item at any time, e.g. what is the status of WIP inventory or what is the status of Accounts, Receivables, Payables, etc. of the company on a particular day. This was not possible in the existing system

At the same time, the automobile industry in India was witnessing fierce competition between different players. Several global manufactures were setting up manufacturing facilities in India. New models were being introduced almost every six months. The auto market leader Hideo saw first time its market share falling over the last few years. This affected SRHL too and the performance of the company came under some pressure. Company was forced to

offer competitive prices for its product in order that Hideo continues to enjoy a dominant position

To face the increasing competition in its industry, company was seriously thinking about its future. The management did its own analysis and looked for various ways to strengthen the company. The management felt that concerted efforts in the area of cost reduction at all levels of company would be continuously required. All these had increasingly necessitated the optimization of the supply-chain. Because as analyzed, inefficiencies in the supply chain lead to higher inventories at all points. This adds costs related to wastage, blocked funds, and the risk of holding obsolete products. Management finally arrived at the conclusion that low inventory levels at all points of the supply-chain would help the company to be amongst the lowest-cost manufacturers in its industry.

Company's Associate Vice President AVP (HRD & IT) started looking around for the software packages available in the market. Thus around somewhere in mid 97, the company had started thinking seriously for some integrated package for its operations.

Information Technology had its own presence from quite sometime in the company. IT was being used in invoicing, payroll and other simple day to day activities of the organization. Apart from it, company had developed some in-house packages for its various activities. However there was

no integration between different departments in the company and there was little use of IT in the Manufacturing department

Enterprise Resource Planning (ERP) was just emerged as new management buzzword at that time. Foreign companies like SAP, Baan, & MFG PRO had entered in the Indian market and vigorously looking for Indian companies for implementing their ERP systems. It was around that time company's AVP IT thought that company should go for ERP & put the idea before top management in a meeting. He said to top management "Certainly speed of various operations is the success factor in today's time. If we go for ERP, we will be in position to process faster our inventory. This in turn will help us to increase our turnover and to reduce our inventory quickly. In short no other software can give us all information at the same time as an ERP package can give." The top management liked the idea & asked the AVP IT to do a cost benefit study for implementing ERP.

## **5.5 SELECTION OF PACKAGE & IMPLEMENTATION PARTNER**

The various factors that were considered in the Cost Benefit study of ERP implementation included investment involved, outsourcing the IT, consideration of security & sensitive information & improvement of business processes. After having decided that the company will implement ERP, in November 97 management appointed a leading consultant for the selection of the

ERP package and implementation partner The management of the company thought that it would be better to select some international package from the available ERP packages because an international package will work proper Also it was to examine whether ERP package offered by the various vendors are upgradable or not in future, whether it could provide some extra features or power to the company & whether it was within the company's budget or not. With the help of the consultant the company short-listed 2 packages namely PAS<sup>1</sup> & KAN Since the KAN package was 4-5 times cheaper than PAS and KAN was implemented in the similar manufacturing conditions overseas, the company finally decided to go for KAN IV as a system application and Inmorfis as relational database. In implementation partner selection, the company looked for implementation partner who knew KAN better and had some experience with it. It was also assessed how much their involvement would be there in implementation exercise & how much involvement would they require from company's employees i.e. how much would they like to involve the company's employees. Implementation partner's past performance & cost of their services were another important considerations. ICM was finally selected as the implementation partner. Initially it was thought that ICM would do all implementation but later localization of the software was carried out by HCS

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<sup>1</sup> Both PAS & KAN have their origins in the Europe PAS has wider experience in ship- building business, essentially an assembled to order industry KAN mainly caters to the middle & small, make- to- order manufacturers

## 5.6 PROJECT SCOPE & CORE TEAM

Company did not set up specific goals for ERP implementation. Also no bench marking was done for implementation. Company thought of ERP as an enabler & supporter for its various operations & defined broad objectives like reduction in, inventory, cycle time and paper work should be there after implementation.

As far as project scope was concerned, management decided to implement ERP in Finance, Sales & Distribution & Manufacturing functions in the order. Initially there was plan not to touch raw materials import in the implementation but later import of raw materials was also included in the implementation. AVP IT was given charge to lead the project. IT department of the company was also strengthened by inducting 4 more personnel. A core team was made to implement the ERP. Core team consisted of the key users from each functional area: inventory, accounts, sales, distribution etc. IT Manager, Deputy Manager and three members of implementation partner were other members of the team. The basis of selection for the key user was that he should have at least 3 years of experience in the company, and has exposure to almost every activity of his department. For example key user from production had the exposure to press shop, execution lines, production norms & standards, raw material procurement, reworking and quality related problems. A 3-month modular training was given to the core team members on how to use the different sessions

of the software package. The training was imparted through lectures, practical and exercises. The key users had the responsibility to see that their functional requirements are understood by the implementation partner. These key users then had to involve end users of their department, explain the system and impart training to them. The core team used to report to the project leader. There were two levels of meetings for monitoring the progress of the whole exercise. At top level it was steering committee headed by Managing Director of the company, used to meet at interval of around 1 month. Apart from consultant's representatives, project head & functional heads were participant in this meeting. At another level core team used to meet fortnightly. Functional heads role was to monitor the progress of the project in their functional area and to facilitate the interaction on the interdepartmental issues, like those of what will be the impact of the new practices in distribution on finance and manufacturing areas etc.

## **5.7 PROJECT IMPLEMENTATION**

The project started in July 98 with the existing processes visualization of the company. The existing processes were documented, i.e. Business Mapping Reengineering was done. Then implementation partner explained KAN and its built in business practices to core team. Then matching was done between processes. These processes were then attuned on KAN by high tuning for actual needs of the company. After testing the existing processes on KAN, the KAN software suggested the various possible solutions. These

solutions were discussed and then implemented in the company. “Customization” and “localization” were done in the software to match the company’s specific requirements and for local Indian conditions. In finance module a lot of localization was done to make it applicable for Indian Modvat, excise & sales tax structure. Similarly in manufacturing module, customization was done in the sheet metal receipt system. The company measures received sheet metal from vendors in Nos while on shop floor it is designated in Kgs. However software could show the sheet metal quantity in Nos only. This resulted in the discrepancies. So a standard formula conversion was incorporated in the software to convert the Kgs into Nos so that company could use Nos measurement with its vendor reconciliation and Kgs measurement for further reconciliation on shop floor. Similarly there was no provision of accepting of reworked material in the system and hence it was incorporated in the software for the company need. Some of the company’s transactions were redesigned to make it adaptable to new ERP system. Material sending practice in the company was earlier done on payment basis while in KAN IV process of material sending was based on sale invoice basis. The management felt the sale invoice method more appropriate and correspondingly company changed its material sending practice to sale invoice basis.



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## **5.8 PROBLEMS FACED DURING IMPLEMENTATION**

There were some problems which company had to face during implementation. First of all, there were installation problems. As IT personnel of company later admitted that there were lack of knowledge on part of the implementing partner. Since the foreign ERP companies had just entered in the Indian market at that time, there was no proper expertise available in India for implementing ERP packages. Experienced implementation partners (consultants) were very few at that time. Same consultants were learning the functioning of the ERP package on one side and implementing on the other side. It was the case in the SRHL also. Initially consultants could not understand the inside structure and requirements of the company. After many deliberations they could comprehend the inside structure of the company.

But the most important of these problems was the change in the mindset required for the company's employees to switch from old manual practices to new system. For this top management had to explain the concept of ERP to the functional people. Employees were motivated through open letters and appreciation letters from Managing Director. A number of meetings were arranged with the consultants for the functional heads & key users from each function. These meetings were used as platform for discussion of the new practices that were to be adopted. These practices were evaluated by demonstrations, and seminars. As IT head (who heads HRD also) after the whole

exercise once said, “There should be IT environment in an organization for successful implementation of such projects Employees should be computer friendly As far as my organization is considered, I now try to ensure that as far as new recruitment is made, the entrants should be at least comfortable with IT ”

IT head was not very happy about the roles played by different functional heads during the whole exercise In his view, functional heads were not very supportive and their support came just in words There was not enough involvement from production side particularly. Even top management could not do much about this. When asked, how did he tackle these issues, he said that from every department, some promising and forward-looking personnel were selected and they were given charge of their department during the project execution. Thus in some cases, department heads were not representing their departments in the project Some of the employees about whom the top management had unfavorable opinion were given ordinary and routine work of project implementation. The functional people had their side to tell. Since each key user and other functionary involved in the project had to do their routine job also in addition to ERP implementation They found it too demanding and could not give their best to the project.

Just before the project completion, some of the key persons from the IT department left the company for better opportunities available to them outside They could leverage their newly acquired ERP experience and skills for

better rewards. The company had to then recruit 2 new personnel in the IT department. Fortunately these new personnel had some prior experience of KAN implementation experience elsewhere.

With all these odds, company was able to complete the whole project on dot in 40 weeks time. On project expenditure side there was only 3-4% variation between estimated & actual cost (Rs one crore).

## **5.9 SYSTEM CHANGE OVER**

After feeding of all data in the new system, company started using ERP applications from 1st April 1999. Initially for trial period, the company used, both, its existing system of keeping records, and new ERP software, for its operations to cross check the data and to keep a backup in case of any problem with the new system. There were difficulties in switching over from older systems to new systems. These were the information errors, which cropped up at the point of change. There was no physical match between inventory shown by the system and those actually on the shop floor. For example, the systems record for a particular part no. used to indicate some quantity on hand, but this figure was not matched with the physical count made. Some times raw material was lying on the shop floor but was not entered into the system. Then there were difficulties in linking up the WIP inventory. By continuous streamlining of the system these problems were rectified. It was also

found that some items need more and some require less information to be entered into the system. Correspondingly information about items were recompiled.

## **5.10 ADVANTAGES OF THE NEW SYSTEM**

The company has benefited in several ways from ERP project. The ERP system interlinked the various departments. Because of interconnections if any department now wants to know how much quantity is in dispatch, it can be easily known from the system. Finance people can ascertain how many sales have been recorded at any point of time. Earlier they had to compile a lot of data to ascertain the same figure. The material receipt system has been streamlined. Earlier there was no check, whether a vendor supply is as per his schedule. Sometimes vendors used to supply in excess of their schedule and that was accepted at the company's store. Now when a vendor's supply is received, it can be easily checked from the system whether it is as per his schedule or not. Vendors provide on line basis and thus they have become a lot more disciplined. ERP has been helping company to use Materials Requirement Planning mechanism for planning & control of materials and other resources. New system automatically generates the production plan while earlier production people had to do a lot of calculations. Thus production planning & control department knows more clearly about its priorities, which help it in planning properly.

Time saving is also there in new system. Daily reports were earlier prepared by mid day. In new system reports are prepared by early morning. Hence timely action can be taken early. As production planning & control heads said after project completion that timely information has lot of value.

Productivity analysis of employees and tools can be done more properly. Now a component history can be known on a click of the mouse and it can be seen how many times it was rejected on previous day. From shift wise workers efficiency it can be ascertained how many workers would be needed for a particular job.

Any production lost is also known immediately. Work in process inventory has been reduced by a significant amount. Company can see how much raw material inventory is on hand, how much it costs to manufacture each product and where each order is on the shop floor. Papers no longer move in zigzag fashion and paperwork has reduced significantly.

Finally workflow management has become much more flexible. With a clear picture of the workflow around, employees at company can plan through bottlenecks and thus minimize production delay.

## **5.11 AFTER PROJECT DEVELOPMENTS**

After the completion of the project, the company gave yearly contract to KAN for day-to-day problems clarifications. Small problems are posted on the KAN web site and company received the solutions for them. For major problems IT manager used to pile up these complaints from different department in using the new system. Then consultants are called for a day, sometime to solve the problems. In this way consultants are continuing with the company for 1 year after the completion of the project.

## **5.12 A SYSTEM CRASH**

Soon it became clear to management that it was imprudent & uneconomical to do the same work in both systems. So management decided to change over to new system completely. The new ERP system worked fine for quite some time.

One fine day, the ERP system collapsed. This created panic in the management as the non-working of the ERP system severely affected the day-to-day operations of the company. AVP IT immediately called the KAN representatives to revive the ERP system. KAN representative gave the suggestion that it seems Inmorfix Database is not fully Y2K compliant so the upgrading the Inmorfix, porting set and service part of the system will enable the ERP system to work properly. The management of the company immediately

acted on the advice. Meanwhile to run the normal day to day operations, the company reverted back to its old system. Although the ERP system started working in some parts of the company's operations after Y2K compliant exercise, the system became very slow in functioning. It could not properly run the company's day-to-day process programmes. KAN gave a number of solutions to the company, but none of them could fully rectify the problems and company was not able to achieve its target. Later it was felt that there are lot of bugs in the Indian localization of the system. Persons from HCS were called to rectify these problems. Even after that the system could not be fully rectified. Soon each of the three parties KAN, ICM & HCS involved in the ERP implementation started blaming each other for improper functioning of the ERP system.

Company management feels that the supply chain version of the KAN system, implemented in their company was implemented in very few organizations in India, so its implementing partners could not fully understand the company's requirements and systems adaptability to that. Finally the KAN representative suggested that the company should change its hardware as number of users has increased a lot. Earlier there were only 28 users, now the company has 40 users using the system. Company management in a fix whether it should change hardware and upgrade server or not because a new server will cost a minimum of Rs. 25 lacs. Moreover server up gradation problem will be recurring



say again after 4-5 years because the management will use more & more data and the upgraded version will become insufficient to support the excess data

### **5.13 USER GRIEVANCES**

Even though company is using ERP in very small area at present, but the grievances of users can be heard there also, particularly because of the slow speed of the system. As ERP system takes 3 to 5 minutes in making 1 invoice whereas in the older system it used to take 1 minute for making 3 invoices. And considering the fact that the company makes more than 300 invoices daily, the new invoice making process takes a lot of time of users. Most of the users complained that simplicity of the earlier system has gone and new ERP system is too complex. There are certain features that are not required by the company and some of them may not be useful for next few years. Number of steps in data entering required by the ERP system are too many and lot of things could have been done in simplified way. As one walks in the accounts department of the company, one can hear employee saying that company has wasted great money in implementing the new system when the earlier system was better than the present one. Even the senior management was not using the ERP system for their reports.

As Sales & Distribution head sarcastically admitted, “at present our manufacturing process has faster speed than the new ERP system” & hence

the new ERP system is unable to support manufacturing Vendor payment system is also linked to the new system, so sometimes they also suffer because of late payments

Then there are problems that arise due to improper inputs Integration problems happen when wrong data is keyed in by some user, resulting in serious errors everywhere in the system AVP IT did not expect the repetitive nature of problems of this magnitude would occur in actual practice and is trying to improve the efficiency of the new system

In the ERP system role of IT department has increased a lot. Their presence is required more & more in every department As some users had the opinion that IT personnel also take now more time to understand their problems and suggest possible solutions. Most of the users had complained that new system has started to become a constraint for them. As IT personnel after much analysis realize that KAN did not perform proper indexing in its system and did not recommend proper hardware sizing. Now top management feels that it had left a major issue unaccounted in the cost benefit study of the project It was the money that had to be poured into making the changes in different parts of the organization that the software demands like recurring expenditure in upgrading, replacing and clustering of servers which also plays major role in cost of such projects.

However the management of the company is hopeful that ERP system will soon be on track and company will be able to achieve its goals of inventory and manpower reduction

According to VP (IT), the bottom line of the company is the ultimate parameter to measure the success of the ERP. Direct savings in next 3-4 years would tell only whether the company's decision of going for ERP was right or wrong

## Chapter 6

### CASE: LENOX LABORATORIES LIMITED

#### 6.1 CORPORATE PROFILE

Lenox Laboratories Limited<sup>1</sup> is the first pharmaceutical company to implement ERP in India. One of the India's largest pharmaceutical companies, Lenox manufactures and markets branded generic pharmaceuticals, bulk substances, intermediates and commodity generics. The company was incorporated in 1962 and went public in 1973. The company's turnover for the year 1998-99 was over Rs 1700 crore. Out of this, 95.8 % was from pharmaceuticals and the remaining 4.2 % from allied businesses namely animal health care, diagnostics & chemicals. In the same year it had a market share of 5.2% of formulations in India and accounted for 13% of India's pharmaceutical & drug exports.

Lenox has 12 subsidiaries across the world. The company has made acquisitions and entered in joint ventures in USA, UK, Ireland, Thailand, China, Egypt, Hongkong, Malaysia & India.

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<sup>1</sup> The name of the companies, software vendors, and the places described in this case study have been changed in order to protect their identity.

Lenox sells its products in over 40 countries across four regions - India & Middle East, Europe, CIS & Africa, Asia- Pacific & Latin America, North America and has manufacturing operations in 7 countries. Nearly half the company's sales are in markets outside India.

The company has its corporate office at New Delhi and two research labs around Delhi. In India, the company has manufacturing facilities in Punjab, Delhi, and Madhya Pradesh (M.P.).

There was already an IT culture in the organization. The company had been using IT in communications. This was through VSATs, leased line and Internet.

## **6.2 LENOX'S STRATEGY**

Lenox considers the organization mission as "becoming an international research based pharmaceutical company and to reach a turnover of \$ 1 billion by the year 2003".

It has a work force of over seven thousand people working in different countries. Nearly a sixth of the company's people are of non-Indian origin.

The company has chosen to build a high degree of backward integration. It currently produces 25 bulk drugs and plans to add 3 to 4 new drugs to increase its range.

According to the company, a significant part of its revenues are from branded generics. It has built significant brand marketing capabilities in the Indian market. According to the company, it has 3 of the India's top 10 brands, and 5 of the top 25. In China and Russia, it has leading brands in anti-bacterials and gastro-intestinals. Out of 40 markets in which company operates, in 26 it markets its brands through its own sales/marketing teams. The company recently entered in co-marketing alliances with two leading pharmaceutical majors for Indian market. It has also developed an active list of 25 global brands, which it plans to roll out in different markets over a 5-year time frame.

Research is a critical thrust area for Lenox. It has 300 scientists and technical personnel to support its R&D. The company research has been focused on new drug delivery system and new drug delivery research. It spends nearly 5% of its revenues on R&D including a discovery research programme. So far company has developed 3 potential lead components and 26 Active Pharmaceutical Ingredients (APIs) & Advanced Intermediates. In October 98 it filed its first investigational new drug application in the area of Benign Prostate Hyperplasia in India.

### 6.3 WHY ERP

The company personnel feel that there were some problems in enforcing quality control. Also the company wanted to improve its market presence in generic pharmaceutical industry where marketing plays a major role in differentiating between players. At the same time company was focusing on production and business process improvements that could release locked values across its supply chain through reduction in inventories, receivables and other work-in-process.

Top management was more concerned that the company's information processes were not strong. If one needed information then it took a lot of time to extract, and delayed information has little value to the organization. There were basically two components of information, which were important to know; one component was production-related information. The other component in which the company was more interested, was knowledge or information gathered by its employees (Marketing, R&D etc.) in the context of their independent functioning. These included market contact addresses, results of R & D experiments, etc. Others in company may quickly access these information or knowledge through a ERP enabled system.

As the management saw the company move up the value chain from generic drugs manufacturing company to a research driven pharmaceutical

company, this managing of information, and of knowledge through experience became an important strategic factor. It meant ensuring connectivity across the enterprise to gather, manage and use information

The idea to go in for ERP was initiated in August 96. The managing director used to visit abroad on business trips. During one such visit, he saw the ERP implementation in one of the foreign companies and came up with this idea for his company. He discussed it with other directors in his organization. The management saw ERP as a future wave, which was going to affect the companies across the globe in a big way. Management expected that it would help in cost reduction through tighter integration of information and enhance value by enabling better overall responsiveness of the supply chain. Further ERP implementation and the enhancement in information infrastructure will serve a significant step towards building a knowledge sharing system.

#### **6.4 FORMATION OF BUSINESS RELATION GROUP**

The company combined the departments of strategic planning & information service, appointed 4 consultants and formulated a new group called Business Relation Group to give the appropriate thrust required for information to enable its businesses. The consultants came in from different disciplines. Two of them had experience with the ERP implementation overseas. One consultant was a member of the implementation partner for an Indian Company. Two



management trainees were also associated with this group. This team of six was formed in mid 96. This group had to find out whether the company needed ERP, and to create ERP awareness. The group invited experienced people, who were part of ERP implementation overseas for presentations to top management.

The group, after analysis, reached the conclusion that to enable effective utilization of resources, the company should invest in ERP applications across the value chain. The top management decided to go for ERP and a formal go ahead was given to the group in January' 97. The group was asked to see what were the company's needs in its ERP package and what would be the various functions in which ERP would be implemented. It was decided that ERP would be implemented in Sales, Production, and Quality.

The group then outlined its various requirements. The most basic requirement stated was that ERP package should meet at least company's current objectives. For this users documents were prepared. These documents consisted of the processes that were the bare minimum requirements of a package. These user documents were circulated and widely discussed in the organization.

## **6.5 SELECTION OF SOFTWARE AND VENDOR**

A list of ERP vendors from all over the world was prepared. There were very few Indian companies providing ERP solutions at that time. One of the consultants in the group informed that he did not have good

experience with the Indian package on one Indian implementation site. The group decided that it would not go for Indian package and would select some international company's package. The group short-listed 4 overseas packages for its ERP implementation. The list included PAS, PCBS, Arocle, and GMF/ROP. Each of them had their own advantages. PAS was the world market leader at that time and had the provision that server was with in the package. PCBS was a specialist in pharmaceutical industry. GMF/ROP was very easy to implement, could run on CD also, and had low cost and ease of training. Also, a leading Indian FMGC company had implemented the GMF/ROP. Arocle s was launched in a big way at that time from Arocle, one of the most reputed software companies in the world. The group matched its requirement to software offerings, saw the implementation experience with these software and growth potentials of the respective vendors.

The group finally decided to choose between PCBS and PAS. The group did extensive techno- commercial evaluations of the two softwares and visited the various sites in India & abroad where these softwares had been implemented. The group talked to actual users, functional heads and inquired about the problems they faced and the time they took for implementation. A financial evaluation was also done between PCBS & PAS. Although PAS was expensive, it had the advantage of reputed partners, in both software & hardware.

After that, the company started negotiations with third party consultants to become implementation partner. Since it was PAS's first implementation of ERP application in pharmaceutical industry in India, no implementation partner had enough experience, PAS India was therefore asked to lead the ERP project. But PAS India didn't have expertise for implementation at that time and there were at least 15 to 18 consultants needed for such a big project, it expressed its inability but suggested some leading consultants name for implementation partner. Lenox selected a leading consultant from the list as its implementation partner. Simultaneously company started enhancing capabilities of already placed networks of PCs, investing in VSATs for bandwidth, speed and reliability and in raw computing power towards building a proper information infrastructure.

## **6.6 STEERING COMMITTEE**

Implementation partner started the project by identifying company's needs. A steering committee was formed for the project in June- July 97. The committee consisted of 8 functional heads, 4 persons from production, 2 from quality, 4 consultants of Business Relation Group and 4 consultants from Implementation partner. Thus in all steering committee consisted of 22 members. Executive Director was chosen as the leader of the steering committee. One more committee was formed for monitoring, budget reporting and overall time scheduling during the project implementation.

By January 98, in order to assess training needs, the resume of each member of steering committee was taken. The consultants analyzed each member on various parameters- whether the person can fit into various activities, bent of mind, IT solution capacity, career prospects and load taking ability during high stress project. These persons were divided into two groups and sent on training for 5 modules namely IT, Finance, Sales & Distribution, Materials Management, and Production Planning.

An intensive workshop for the steering committee to analyze the current key business processes was conducted. The committee analyzed how good, for example, were company's service- levels, size of operating cycles, inventory and receivables management, asset productivity etc. in comparison to the best-in-class in its industry and where did the company wish to go. These parameters were further drilled down, for instance, the fidelity of the sales-forecasting process was found to have a critical impact on the responsiveness of the supply chain, hence company's service- levels. Then current fidelity, the gold standard, and the desired level formed the basis for assessment of the gaps to be covered. The steering committee then decided the extend to which the ERP solution would enable the desired improvements in the process. All the expectations from the ERP initiative were quantified.

## 6.7 PROJECT SCOPE

The next step was the finalization of the project scope. There were two alternatives before the company. The company decided for phased implementation and took 5 sites for ERP implementation in the first phase. The company decided to go for entire export, some internal operations, Sales & Distribution, Production, Quality, Materials, Finance and Costing.<sup>1</sup> The selection of locations was done to facilitate the above approach. Dewas (Bulk Drugs manufacturing), Delhi (Corporate House), Indore (regional warehouse for domestic distribution), Okhla (export warehouse), Mohali (Active Pharmaceutical Ingredient production facility) were selected as implementation sites for the first phase. This included one formulation Plant, (the largest and most complex of all company operations. the problems encountered here would help the company to redesign its strategy, if necessary). Also included were one API plant, one export warehouse, one domestic warehouse, one sales branch & its corporate office to take care of all regional offices.

## 6.8 PROJECT IMPLEMENTATION

The time frame for the first phase project was set up as 1 year. This Project phase was named DIAMOND (Digitally Integrated Applications

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<sup>1</sup> The only area, which was left untouched, was Human Resource module since PAS did not have module at that time. However, much later, when PAS started giving this package in India, this module in Personnel requirements and Personal development is being implemented in the organization.

For Managing Operations and Networked Development) and rolled out on 14th April, 98 and supposed to be completed by 14th April, 99

## **6.9 CHANGE MANAGEMENT**

There were few changes made in the organization. Some coordination and consolidation posts were created in order to facilitate the smooth completion of the project. The top management recognized early in the project that ERP implementation was more to do with people than with the technology. Therefore management concentrated more on its people and gave a lot of stress on Change Management. For this, the company utilized consultants from UK. The team members spent 3-4 days in the UK and got trained for the entire framework suggested there. These members then worked on the team as Change Agents. The framework involved a lot of analysis and psychological tests of the people, which were going to be affected by the ERP implementation. The team members prepared a list of around 400 people of the organization, which were going to be affected by PAS implementation. Profile of each person was prepared and groups of people with similar reactions were formed. The management wanted to have training for these affected people in such a manner that a very well planned change could be achieved.

For this a framework for every person was prepared. The framework included person's job description, his qualities and earlier reactions to

these types of changes, i.e. whether the person is not positive to changes or likes the changes or only listen to his boss or his boss needs to be made positive in order to make him adaptable to changes. This framework was further enhanced by including attributes of every person including his/her personal traits, skills, commitment, credibility, and etcetera.

The framework was analyzed for each person and change areas were identified. Accordingly training was given to him or her. The training stressed the minimization of the negative and enhancement of positive points for every individual. Thus each individual was mapped out as per his or her requirements. Training was conducted mainly through workshops. In the training, functional heads were given the task of change leaders; the full steering team played the role of change agents. Those who were going to be affected by ERP were identified as change targets. The change leaders were also given special training, if found necessary. The training was given by the steering team. A training coordinator post was created to oversee the training. The team prepared two manuals for the users. First was the user-training manual in which slide presentations were given to the users about general information of the processes. The second was the user procedure manual in which actual training about new processes and how to do them were given. This manual also consisted of the job responsibilities of every employee.

In all there were 40 courses in the training. Each course was tailored to the need of the particular functional group. A training calendar was prepared and training programmes were scheduled at 3 basic locations.

A lot of literature survey and case studies were done to help out the people when they faced the problems. Once the project started, the focus of entire training was on people and not on IT. In this way the management reduced the resistance to change to minimum. Even when the people complained about the problems because of new processes, they were asked to carry on with their work even with the problems for 2-3 months. They were exhorted not to give up in face of their problems. In this process majority of them started appreciating the new processes after some time and are working happily.

## **6.10 PROJECT NEWSLETTER**

The management in a number of ways ensured that the ERP implementation decision is never looked to simply buy an IT tool, instead, how to shape the business. For this the steering committee came up with a newsletter and disseminated information about the project DIAMOND. The teams tried to convey each of the affected people in a simple plain language that what would ERP do in the organization. The newsletter facilitated users interaction and general discussion about the project. The users used to pose their doubts in the newsletter and they could freely air their concerns about the project. These



doubts and grievances were given necessary attention and team members used to clarify these doubts through newsletter. After the project completion, the consultants saw this newsletter as useful interaction tool, which played a major role in the successful completion of the project.

The Managing Director and other top management were well associated with the project. MD used to visit Mohali once in around 45 days, review presentations made there and attend the monitoring meetings. Most of the departmental heads agreed that managing director was the main sponsor of the project. He used to review project at every stage, see prototypes also and was thus deeply involved in the project.

After project completion, management feels that implementation of export and import modules in project were major areas of frustration & pain. It did not analyze the extent to which the globally developed package like PAS had been preadapted to the needs of the local business framework. These were the modules in which company's excise, customs and other requirements as per Indian conditions were taken care of. However management feels that they have achieved major gains also in these areas, once these modules were implemented.

## 6.11 ERP BENEFITS

The company has benefited in many ways after ERP implementation. Earlier, management was spending much time on getting & analyzing the information and finally using the information. Now information is available in user friendly format and can be analyzed easily. Management feels that ERP implementation has created transparency in the organization. Information required to take any decision is available at the right place & at the right time. The rich flow of information across organization allows users to base their decisions on facts more than opinions. Operations have been decentralized which has enhanced the effectiveness of decision making.

Since a major part of the organization has started working on ERP, communication and time cost has reduced. There is reduction in time taken to manufacture or service an order because of reduced lead-time.

Its supply chain has become more efficient and there is zero duplication in the company's operations. There is reduction in inventory. Product codes are not confused as one product has one code.

Cost reduction has been achieved because redundant activities have been removed in the new system. Then there is reduction in working capital and increase in operational efficiency across functions. This is very important.

from industry point of view because in generic drugs industry the emphasis is on low manufacturing cost

Testing plans and procedure for the drugs have come on ERP. The system does not allow any quality loop holes in the process to pass, this has improved the quality checks on the processes.

The company has made major advances in scheduling. Earlier there used to be buffer of large quantities between two workstations. In new system this has come to a lower level. There has been major streamlining in the delivery schedules.

Company's vendors have also benefited from the ERP implementation. They can now track their orders and get to know the status of the orders inside the organization easily and fast. As one consultant after project completion said, there was virtually no resistance from the vendors. In fact they wanted this to happen.

In new system base processes have been made uniform. Once the ERP will be implemented in all of the company's locations, the business practices will get standardized in the organization all over the world. This will help company in working in different countries. Since the company's operations will work on same system, it can transfer its employees to anywhere to take

assignments in its operations. The management feels that this will break barrier between its various countries operations

The first phase project was successfully completed in Mohali first and the system went live on 5th April 99 at Mohali. Some other sites went live on 14th April 99 and by end April, 99 the implementation at all sites of first phase project were completed

## **6.12 SECOND STAGE PLAN**

Post April 99, the company rolled out its second phase plan in which two more Active Pharmaceutical Ingredients Plants, one Formulation Plant, R&D lab near Delhi, two domestic ware houses, two Sales & Distribution Branches and the US operations were included. The management is keenly awaiting the ERP installation at its R&D facility near Delhi because as pointed out earlier research is a critical thrust area for Lenox upon which its other strengths lie. The scientists working there have to have all information about the company's operations in order to come up with new solutions in the patented market. The installation of ERP at some manufacturing facilities has streamlined the system particularly in materials coding and with the installation of research modules, the process development activities skills at research facility will become much smoother. This will help the company to achieve its goal of becoming a research based international pharmaceutical company. The

rest of the plants and operations are expected to be taken up in 3rd phase and the entire implementation is expected to be completed by end of the year 2000

## **Chapter 7**

### **ANALYSIS OF THE CASES**

In the study of the two cases of ERP implementation, one organization (SRHL) had completed the project but was struggling to reap benefits out of it, the other (Lenox) had successfully implemented its first stage of implementation and extending ERP to other untouched operations.

In this chapter, we would like to discuss the salient features of the two cases and draw the insight from the broad framework that we earlier discussed

#### **7.1 ORGANIZATIONAL OBJECTIVES FOR ERP SYSTEM**

The case for implementing Enterprise Resource Planning (ERP) system had both short term and long term objectives in both the organizations

Information availability through integration between various operations was the immediate concern for implementing ERP in both the organizations

SRHL, an auto component supplier to one of India's major automobile manufacturer had positioned itself on its modern manufacturing

facilities coupled with JIT delivery and quality conscious approach. The management was looking for new tools to improve the company's performance by reduction in costs and increase in productivity to sustain the increasingly competitive scenario in the automobile and auto- component industry.

Lenox, already an established player in the Indian pharmaceutical industry, was attempting to improve its competitive position through a world class supply chain and preparing itself for the knowledge economy. It took an ambitious approach of creating a knowledge sharing system in the organization of which ERP was considered as first step. Lenox is passing through the cultural change in its quest of rising the value chain in the pharmaceutical sector i.e. to move from bulk drugs manufacturer to a research based pharmaceutical company.

## **7.2 INTERNAL SPONSOR OF THE PROJECT**

In SRHL, initial feasibility for the project was done by a single person and since he was from IT department, the message did not go well with the organization. In this way IT head was considered as the main sponsor of the project. Functional people took it as an information technology project.

In Lenox, managing director gave the idea to other directors and they discussed the idea among themselves and further took the help of consultants before convincing. Thus it was a decision by the team at the top level.

### **7.3 PROJECT SCOPE**

In SRHL the management did not setup specific goals and no bench marking was done for processes effectiveness, which were to be achieved after implementation. Instead management defined broad objectives like reduction in inventory, cycle time & paperwork should be achieved after implementation. These were too general. With such objectives, middle management and key users did not have a framework for making decisions, and they allowed the system people to make them. As a result system priorities were not in alignment with company's vision. End users now complain that their ERP system has unnecessary capabilities and locked in complexity.

In Lenox key business processes were analyzed and compared with the best in class in its industry. The gaps were identified and corresponding targets were fixed which were to be achieved through ERP implementation. Finally these targets were quantified.

### **7.4 SELECTION OF SOFTWARE & IMPLEMENTATION PARTNER**

Both companies went for an international ERP package, as Indian packages were rarely available at that time.

In SRHL cost of the package and working of the package in similar conditions overseas were the final criteria in the selection of the software. There is



an interesting point to note in the selection of ERP package in the case of SRHL. Its joint venture partner and main customer Hideo also started the information integration exercise at the same time. Hideo went for in-house developed software package to achieve the integration, while SRHL selected a foreign ERP package that was yet to establish its credentials in the Indian market. The company spent nearly 0.70 % of its yearly revenue in 1998-99 to implement the project. It seems that idea for going ERP and how to go about it was quite independent from its main customer Hideo's strategic point of view. The marketing gimmicks adopted by the ERP vendors also shaped the management choice of selection of hardware and other related services as management realized after the completion of the project.

Lenox matched its requirements to software offerings, saw the implementation experience with the short listed software and growth potential of the respective vendors. Communication with actual users about the software and problems they faced were other important activities in the selection. Cost proved to be a minor criterion in the selection.

Both companies faced the constraints of few available experienced implementation partners for their project. In the case of SRHL same consultants were learning the functioning of the software on one side and implementing it in the company on the other side.

## **7.5 ORDER OF IMPLEMENTATION**

SRHL implemented ERP in the order of finance, sales & distribution and manufacturing. This was because the company was already using IT in finance & accounts. So management thought it would be better to implement in this area first. Manufacturing was taken at last because manufacturing was earlier out of IT and much education in using computer was required to people in shop floor.

Lenox adopted a phased approach for its implementation and selected various sites in such a manner that all functions of the company namely export, sales, distribution, production, quality, materials, finance & costing were covered in the first phase. Some of the sites like formulation plant were critical from company's point of view and the company thought that problems encountered there could help in problems encountered in further implementation.

## **7.6 DESIGN & USE OF PROJECT TEAM**

In SRHL core team was headed by the IT head and the ERP implementation project looked like an IT project to the employees in the organization. Once the top management was convinced about the ERP with an implicit assumption that the benefits would follow, it relegated too much responsibility to its system experts. Once management abdicated its responsibility for control, the core team was forced to make critical decisions by default. One

example, of this was the “scope creep” in the project when import of raw material was included later in the project. The company selected the experienced people as key users but did not release them from other normal responsibilities. No award or incentives were associated with the successful completion of the project.

In Lenox, the each member of the steering committee was analyzed in terms of his strength & weaknesses and it was fully assessed before project whether he can sustain such high stress projects and give full time to it. The members were then sent on the training. Moreover committee’s members career prospects were linked to their performance in this project. In this way company prevented false declarations of success (since the specific targets were setup in the advance) and helped implementation team to resist “scope creep” & focus on delivering results.

## **7.7 FOCUS ON PEOPLE & CHANGE MANAGEMENT**

In SRHL top management did not specifically focus on people. Employees were motivated for the changed process and getting trained in them only through open letters. There was not enough ERP awareness created in the organization. Also functional side requirements were not properly understood by the implementation partner possibly because the IT head was the interface between the functional side & implementation partner. A possibility of IT head

using techy words to his functional counterparts in explaining the new system could not be ruled out

In Lenox right from the beginning, the top management gave a lot of stress on people and on “change management” The steering committee took profile of each person who was going to be affected during project and prepared a framework accordingly The steering committee members acted as change agents on the people who were going to be affected The training was imparted as per the needs of the persons Management tried to disseminate every bit of information about the project through a Newsletter. Users doubts and grievances were welcomed and answered through a news letter. This allayed any fears in the users in using the new system.

## **7.8 TOP MANAGEMENT INVOLVEMENT**

In SRHL although MD used to participate in monthly meetings to take stock of the progress of the project he did not play a proactive role in the project implementation Besides orchestrating the mandatory communications sessions with the rest of his people to explain the whys and wherefores of ERP, he did not involve himself too much in the project implementation

In Lenox executive director who was already supervising the day-to-day activities in the organization headed steering committee. First of all in this way the company ensured that project remained in the control of top

management In addition to this managing director who was the main sponsor of the project used to visit the company's most critical site very often He used to review project at every stage and thus thoroughly involved in the project

## **7.9     ROLE - CONFLICT**

For successful working of such systems, there should be discipline in using system on user's part. SRHL sometimes faces integration problem because the system expects right inputs from the users This may be because management could not create new system acceptance in the users or did not educate the users about the requirements of the new system.

There seems to be a rift between IT department and functional side during project implementation IT head was not very happy about the roles played by different functional heads & key users during implementation In his view, functional heads were not very supportive Functional people had their own reasons of not being involved fully in the project Key users & other functionaries had to do project work in addition to their routine jobs Since ERP projects are very demanding and require full attention from the all functions, the functional people could not concentrate fully in conveying their requirements & understanding new systems features

## **7.10 LACK OF EXPERTISE OF IMPLEMENTATION PARTNERS**

SRHL was struggling in using new systems in its various operations. As most of the end users were complaining that new system had started becoming a constraint for them. This may be because the core team could not convey fully its requirements to implementing partners. On the other hand, as one of the functional heads opined after project completion, vendors that are adept at selling their products to large corporations are not proficient at meeting the needs medium scale enterprises. The lack of experience of implementing partner may be the major lacuna.

SRHL also spent in piecemeal basis in its hardware requirements. The implementation partner did not recommend proper hardware sizing for its requirements and now company is thinking to upgrade its hardware. Although the company compared the cost of the various softwares for its ERP implementation, it did not consider the money that had to be poured into making the changes in different part of the organization that the software demanded. As the project progressed, one of the most critical factors turned out to be the communication channels that the ERP package would need for optimum performance. The proportion of the license cost scaled up with the number of computers that were hooked on to the application, and the company finds itself effectively locked into the software it chose.

## **7.11 COST AND TIME FRAME**

There was no overrun in the time frame in both the companies, as generally feared in such projects. On the cost side also both the companies were able to finish their projects within the time frame. In the case of Lenox, its implementation is in the second phase and company has to cover overseas operations also, its management will have to keep vigil so that the total cost of the project do not vary much from the estimated cost.

## **7.12 DISCIPLINE THROUGH THE ERP**

In the case of Lenox, management had problems in enforcing quality control in their processes. Management felt that some of the employees at lower level were not stringent enough and allowed passing the processes without through check. Now after ERP implementation, all testing plans and procedure have come on new system. The system does not allow any quality loop holes to pass thus forcing employees to be disciplined in their quality control work.

In the SRHL, the processes are affected by integration problem, which basically occur because of wrong data entry. A modern ERP logs everything: date, time, user, pre-update value, and post-update value, etc. thus users' routine use to settle the scores can take away the benefit of the ERP system. In SRHL this is still a problem with the system. The disciplining effect of ERP is yet to be fully realized.

## **Chapter 8**

### **CONCLUSIONS**

Growing number of ERP implementations in India showcases Indian businesses acceptance of this technology at the highest level in both large and medium organizations. However, beyond accepting this technology, users must carefully consider its implications.

In this chapter, on the basis of our study of two cases and subsequent analysis, we would suggest some major factors affecting the process of ERP implementation.

#### **8.1 FACTORS OF IMPLEMENTATION**

As analyzed, the reason for inadequate performance of ERP systems is its implementation process. ERP implementation involves transitions in the working of an organization and a few of them are so massive where getting them wrong can send the company to chaos compounded by computers.

##### **8.1.1 MANAGEMENT INVOLVEMENT & COMMITMENT**

The management involvement and commitment in whole ERP project proved to be crucial success factor in the implementation process. The



large investment needed to implement ERP ensured top management involvement in both the cases. But top management involvement is not tantamount to top management commitment as can be seen by the comparative analysis of the two cases. In the SRHL top management was involved but not committed to its implementation. In the other case it was involved as well as committed to the project.

### **8.1.2 LISTING OF BUSINESS GOALS**

Listing of business goals to be achieved from the ERP in explicit terms determined the further implementation process. This helped the project team to take crucial decisions in the implementation as is clear from Lenox's implementation.

### **8.1.3 DESIGN & LEADERSHIP OF PROJECT TEAM**

Design and leadership of project team went a long way in successful completion of such projects. Only a general manager is equipped to head such a project, which involves a lot of changes in the habits & working of people. If the project is projected as some department specific (as IT project), then it is not received well by the other people. There is need to put the best people on the project team- those whom the user groups can least afford to do without. A sure way to undermine the success of the project is to assign the project assignment in addition to the person's other responsibilities, as is clear from the

SRHL case. It is crucial to find some way to release the project team members from other responsibilities. Proper project team design also requires that the team report to the appropriate management level in the company. The interdisciplinary nature of the ERP project requires high level of reporting to implement those key features that cross many functions.

#### **8.1.4 EXPERTISE OF IMPLEMENTATION PARTNERS**

A major requirement for ERP systems as emerged from the cases is the proper selection of software & implementation partner. An experienced implementation partner can help the company to get a good fit between the ERP applications and company's business processes.

#### **8.1.5 CHANGE MANAGEMENT**

Organization change has to be affected properly for successful completion of the project. Facilitation and support through change agents can be done for dealing with the resistance to change, as carried out in Lenox. Change agents can offer a range of supportive efforts to reduce resistance.

Training & education to each & every affected employee prepared them for accepting changes in the organization that new system brought, as clear from the cases. Communications with employees to help them see the logic of change was done in one case.

### 8.1.6 ORGANIZATIONAL & ENVIRONMENTAL CONTEXT

Before concluding finally, we should also note the differences in the organizational and environmental context of the two organizations

SRHL is an auto component supplier to a major auto manufacture and produces around 200 different types of components & assemblies with 33,000 unit items supplied each day on a JIT basis. The company may have large number of suppliers at each & every stage of its manufacturing. It may be difficult for the company to integrate its information across its diverse manufacturing activities. The company's future is linked with its main customer & joint venture partner Heido.

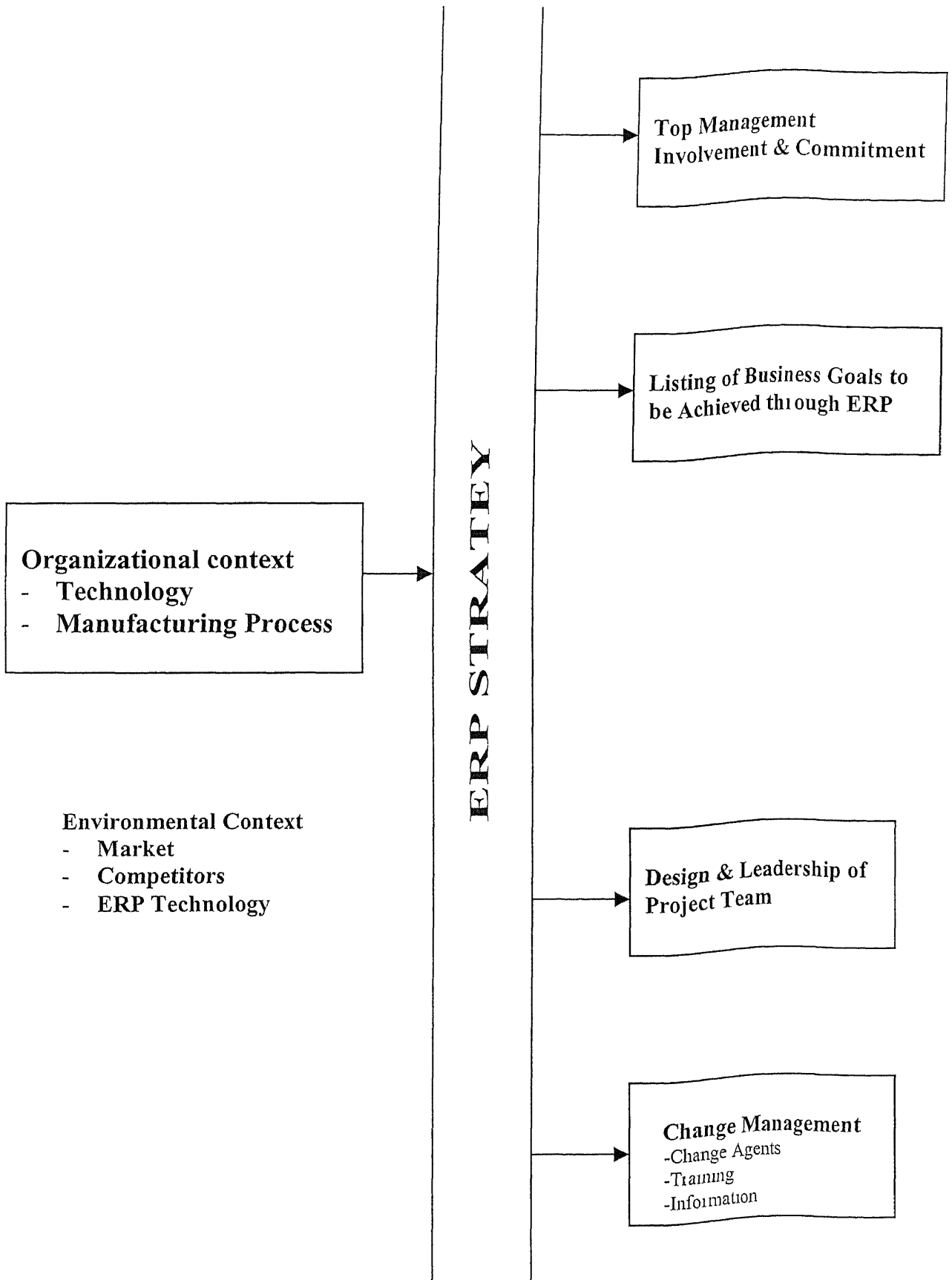
Lenox, is an established player in pharmaceutical industry and major part of its revenue come from 3-4 products namely bulk drugs. The company's chemical processes e.g. formulation plant were already automated and have good integration. Since company has also made significant backward integration, hence less dependent on its suppliers.

Thus there are some outstanding differences in company's technology, market and environment. Comparing the organizational and environmental context in the two organizations, we can say that Lenox had some advantages over SRHL in absorbing ERP project.

Thus in Lenox, scheduling problem is not as high as in the SRHL. In SRHL, to get the information integration between various processes were much difficult to attain as compared to Lenox. Thus it can be concluded that Lenox was in better position to implement ERP projects.

## **8.2 A PROPOSED DESCRIPTION OF ERP IMPLEMENTATION**

Finally, we have integrated the above arguments in one single model, given on next page. The motivation for proposing the model is to provide a conceptual framework by which the process of ERP implementation can be understood in terms of its attributes, along with the factors underlying them. The model shows that strategy (of ERP) is shaped from both organizational and environmental context that exists for the organization. The organizational context includes technology and manufacturing (e.g. whether it is highly integrated or not). All this is within an environmental context of the organization. With these contextual factors, the organization formulates a strategy, such as ERP. It then implements the strategy. The clarity in such strategising would be a critical factor in its success. The other critical factors relate to implementation process. Some of the factors that emerge from this study are top management involvement & commitment, expertise of implementation partner, listing of business goals, change management, and design & leadership of project team. These factors play a crucial role to make the strategy (of ERP) successful.



**A PROPOSED DESCRIPTION OF ERP IMPLEMENTATION**

## **Chapter 9**

### **LIMITATIONS OF THE STUDY**

#### **9.1 METHODOLOGY OF THE STUDY**

The methodology of the study imposes restrictions on the study. Constraints of time and resources have limited the number of cases. Our study analyzes only two cases. Therefore, much generalization is not possible on the basis of this study alone. Further, case study methods are not strong in analysis using statistical criteria, as the data set is usually small. Further the study depends a lot on discussion with individuals, and reports of earlier discussions. Thus the analysis can get affected by the memory and the subjective interpretations by the individuals interviewed, as well as the student himself. Such limitations can be overcome, if more studies are carried out. A large set of cases can help to bring out the common characteristics, on the basis of which generalizations can be achieved.

#### **9.2 ERP IN INDIA IS STILL EVOLVING**

Both the companies in our study had just implemented the ERP. In the one company it was still in the process and expected to be completed by the end of year 2000. Since the ERP applications came in India very recently hence most of the organizations approached were either in the implementation phase or

thinking to implement it in the future. These types of projects have long gestation period hence only after 2-3 years of implementation their real benefits can be visualized. Studies in future can analyze such implementations in detail and depth.

### **9.3 EXTERNAL SOFTWARE AND IMPLEMENTATION**

In this study both of the companies had implemented software from outside vendors. Further the implementation was carried out by outside consultants. However it would be interesting to analyze in-house developed ERP application and an implementation carried out by users themselves in the organization. In fact a matrix can be formed with the in-house and external software on one side and in-house & external implementation on the other side. A comparative study can be done between all the four possibilities coming out from such matrix.

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